

A Review of the *Sphex flavipennis* Species Group (Hymenoptera: Apoidea: Sphecidae: Sphecini)

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Abstract.—The *Sphex flavipennis* species group, a Palearctic assemblage formerly called the *maxillosus* species group, is characterized, its species are diagnosed, keyed, their distributions summarized, and male antennae illustrated. The large Eurasian wasp formerly known as *maxillosus* Fabricius or *rufocinctus* Brullé must now be called *funerarius* Gussakovskij. Similarly, the species formerly known as *afer* Lepeletier must now be called *leuconotus* Brullé. The following species are included (**new synonyms** are listed in parentheses): *atopilosus* Kohl, 1885; *flavipennis* Fabricius 1793 (*rufocinctus* Brullé 1833); *funerarius* Gussakovskij 1934 (*maxillosus* Fabricius 1793, a junior homonym of *Sphex maxillosus* Poiret 1787; *obscurus* Fischer de Waldheim 1843; and *mavromoustakisi* de Beaumont 1947); *leuconotus* Brullé 1833 (*triangulum* Brullé 1833, a junior homonym of *Sphex triangulum* Villers 1789; *afer* Lepeletier 1845; *sordidus* Dahlbom 1845; *tristis* Kohl 1885; *plumipes* Radoszkowski 1886, a junior homonym of *Sphex plumipes* Drury 1773; and *pachysoma* Kohl 1890); *libycus* de Beaumont 1956; *melas* Gussakovskij 1930; and *oxianus* Gussakovskij 1928 (*nubilis* de Beaumont 1968). A lectotype is designated for *Sphex funerarius* Gussakovskij 1930, and a neotype is designated for *Sphex leuconotus* Brullé 1833. Descriptive notes are provided for the type material of *Sphex atopilosus* Kohl, *funerarius* Gussakovskij, *leuconotus* Brullé, *rufocinctus* Brullé, and *triangulum* Brullé.

It is rather ironic, after all these years, that the proper scientific names have not been established for *Sphex maxillosus* Fabricius 1793 and *afer* Lepeletier 1845, since these represent two of the largest Palearctic sphecids wasps. This problem is corrected here. Initially our study was prompted by Menke's examination in 1964 of Brullé's type specimens at the Muséum National d'Histoire Naturelle, Paris, which suggested that two taxa recognized by Kohl (1890) as synonyms of *maxillosus* (*rufocinctus* Brullé and *triangulum* Brullé) were not conspecific with that species. This was corroborated by Pulawski in 1975, who re-examined the same material.

In 1994 both of us restudied the types and confirmed our prior assessments of them. These were important findings because van der Vecht (1959) noted that *maxillosus* Fabricius was a junior homonym and the species needed a replacement name. Van der Vecht believed that *leuconotus* Brullé was the oldest available replacement for *maxillosus*. However, we are certain that *leuconotus* is a senior synonym of *afer* Lepeletier. In this paper we establish that *funerarius* Gussakovskij is the proper name for *maxillosus* Fabricius and *leuconotus* Brullé the proper name for *afer* Lepeletier.

Our study has enabled us to construct an identification key to the Palearctic species of the *flavipennis* group. This key should be regarded as provisional because these wasps are taxonomically difficult, and we have not made an exhaustive

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study of the species. Too little is known about geographic variation in the *flavipennis* group, particularly the color of the wings, setation, legs, and gaster. These may prove to be variable within some species, but a very large specimen database would be required to resolve species limits and the significance of geographic variation. The apparent variation in male placoid distribution on the antenna also needs to be carefully analyzed, as well as possible variation in the male genitalia. Currently the male genitalia seem identical or nearly so in the taxa we discuss here.

The family group names used in the title are based on Melo (1999).

SOURCES OF MATERIAL

Abbreviations used to indicate location of specimens are listed below with corresponding institutions.

CAS: California Academy of Sciences, San Francisco, California, U.S.A.

Copenhagen: Zoologisk Museum, Copenhagen, Denmark

Dresden: Staatliches Museum für Tierkunde, Dresden, Germany

Genova: Museo Civico di Storia Naturale "Giacomo Doria", Genova, Italy

Kraków: Instytut Systematyki i Ewolucji Zwierząt, Polska Akademia Nauk, Kraków, Poland

Lausanne: Musée Cantonal de Zoologie, Lausanne, Switzerland

Lund: University of Lund, Lund, Sweden

Menke: A. S. Menke Collection, Amphiphila Research Institute, Bisbee, Arizona, U.S.A.

Moscow: Zoological Museum, Moscow State University, Moscow, Russia

Palermo: Istituto di Zoologia, Università di Palermo, Palermo, Italy

Paris: Muséum National d'Histoire Naturelle, Paris, France

Stockholm: Naturhistoriska Riksmuseet, Stockholm, Sweden

St. Petersburg: Zoological Institute, Rus-

sian Academy of Sciences, St. Petersburg, Russia

USNM: United States National Museum of Natural History, Washington D.C., U.S.A.

Wien: Naturhistorisches Museum, Wien, Austria

Zürich: Entomologisches Institut, Eidgenössische Technische Hochschule, Zürich, Switzerland

METHODS

Morphological terms used here follow Bohart and Menke (1976) except that we follow Salmon (1929) for the name of the curved, cord-like "tendon" at the base of the petiole. Salmon called this the funicle, and we adopt his term because it is not a tendon in the true sense of the word.

Measurements of the abdominal petiole are made as follows: the width is measured at the base of tergum I, the length is measured from the base of the funicle (on the petiole) to the base of tergum I.

When describing color we use the term "red" to indicate non-black areas of the legs. In reality, the true color more closely approximates amber, or reddish brown in many instances. Setal color is described as pale or white vs. dark brown or black. In some cases, pale or white setae are really silver.

For the uncommonly collected species we have listed locality records known to us.

The fourth edition of the International Code of Zoological Nomenclature (ICZN 1999) stipulates in Article 74.7.3 that "to be valid, a lectotype designation made after 1999 must contain an express statement of the taxonomic purpose of the designation". These statements must accompany each designation (Article 74.3). Traditionally lectotype designations have been indicated by the words "present designation" and the purpose is clear to all, namely to fix the identity of the name involved. To add a statement after each designation seems redundant and repetitive

to us, but to satisfy the Code, we have followed "present designation" with the following statement "in order to ensure the name's proper and consistent use".

The *flavipennis* Species Group

The species discussed here belong to a lineage that de Beaumont (1960) called the *maxillosus* group. Because *maxillosus* is a junior homonym, we have renamed it the *flavipennis* group, using the oldest valid species name.

Females of the *flavipennis* group share the following defining characters: clypeal disk conspicuously convex, but abruptly depressed near free margin, delimiting a narrow, flat rim; labral apex with inverted Y- or V-shaped carina whose arms project as small lobes; base of Y or V often extending as a median carina toward labral base. In addition to these apparently derived characters, the species lack certain specializations of other *Sphex*: the metanotum is simple (not bituberculate); the propodeal dorsum lacks coarse, widely spaced, transverse carinae or wrinkles; and the propodeal side lacks a vertical swelling anterior to the spiracular groove. Males apparently lack features of species group significance.

The group contains the following Palearctic species: *atopilosus* Kohl 1885, *flavipennis* Fabricius 1793, *funerarius* Gussakovskij 1934 (= *maxillosus* Fabricius 1793, nec Poiret 1787; *rufocinctus* of authors after 1975), *leuconotus* Brullé 1833 (= *afēr* Lepeletier 1845), *libycus* de Beaumont 1956, *melas* Gussakovskij 1930, and *oxianus* Gussakovskij 1928.

In addition to the seven species listed above we have studied three males and one female from Morocco collected at Aït-Saouin (between Ouarzazate and Agdz) southwest of the Jbel Sarhro Mts. (CAS) that may be a new species or an extreme form of one of the currently known species. They resemble *flavipennis* and *funerarius*, but the male antenna has broad placoids on flagellomeres IV-VI, and the fla-

gellomeres are more elongate than in those two species. The female mid and hindlegs are black, but the foretibia and tarsus are reddish.

Species discrimination in the *flavipennis* group is difficult, especially in females. Previous authors have used wing color, setal color, presence or absence of long setae on the femora, and proportions of the petiole and/or comparisons of its length with the length of one of the hindtarsomeres to separate females of some species. However, the separation of females of *flavipennis*, *funerarius*, and *oxianus* is particularly vexing, and association with males may often be the only reliable way to identify these species. The most useful male character is the number and width of placoids on the flagellum (although they are variable in *funerarius* especially; see that species below for details). Other male features that have been used by previous workers are the length of the lateral setal brushes of sternum VII, the form of the clypeal free margin, and color pattern. Generally, however, these characters are not wholly reliable. Male genitalia lack the unusual elaborations found in some sections of the genus and appear identical in species of the *flavipennis* group. The penis valve head is arcuate in lateral profile and is armed ventrally with a row of teeth.

The following authors provide keys, records, and other valuable information on species in the *flavipennis* group: Kohl (1890), worldwide revision of genus; Dusmet and Mercet (1906), Spanish species; Roth (1925), North African species; Berland and Bernard (1949), French species; de Beaumont (1951), Moroccan species, and (1960), placoids of male antenna; Scobiola (1960), Romanian species; Kazenas (1978), Kazakh species; Pulawski (1978), species of the European part of former USSR; Mingo and Gayubo (1984), Spanish species; Hamon, Fonfria, and Tussac (1991), French species; and Bitsch et al. (1997), western European species.

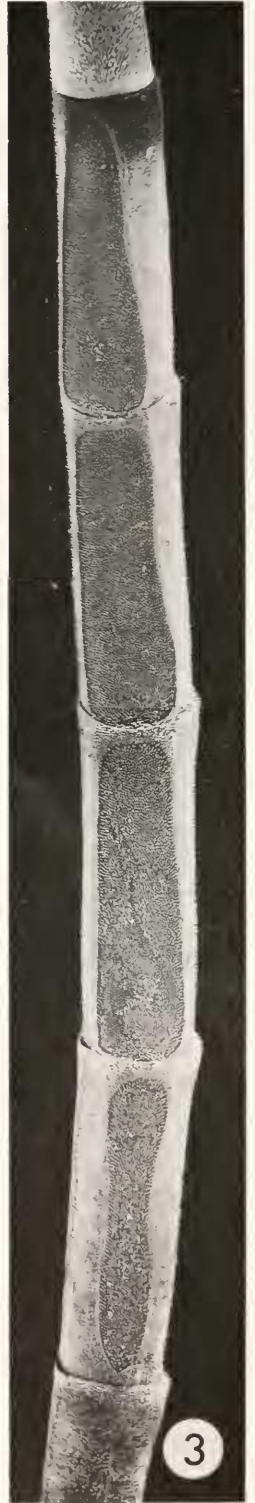
KEY TO SPECIES OF THE *SPHEX FLAVIPENNIS* GROUP

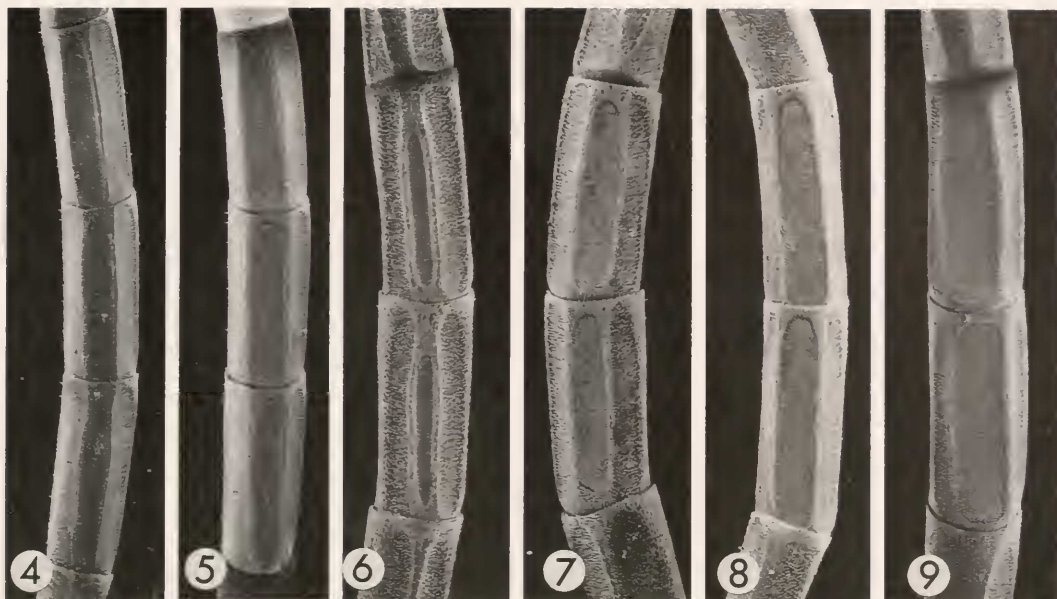
Females

1. Erect setae of head and thorax dark brown or black 2
- Erect setae of head and thorax white or pale yellow 4
2. Gaster red and black (at least tergum II partly red); foretibia(at least partly) and tarsus amber, midtibia partly amber; wings yellow tinted with dark apical band, veins brown; Iberian Peninsula to Greece, Slovakia, Hungary, Romania, Kazakhstan; Algeria(?) *atropilosus* Kohl
- Body all black; wings darkly infumate, with no apical band 3
3. Appressed setae of face brown; hindfemur asetose; Iran, Turkmenistan *melas* Gussakovskij
- Appressed setae of face silver; hindfemur with erect setae; northeastern Libya, northwestern Egypt *libycus* de Beaumont
4. Petiole wider than long (as measured dorsally from base of funicle to base of tergum I) or at least not longer than wide; Mediterranean region to central Asia *leuconotus* Brullé
- Petiole longer than wide 5
5. Legs black (including tarsi); gaster usually all red (sometimes bicolored or all black); eastern Mediterranean region to Afghanistan and Tajikistan *oxianus* Gussakovskij
- Some or all legs partly to entirely red (at least foretibia with some red apically); gaster bicolored (all black in some areas of Kazakhstan, Siberia, China); widespread in Palearctic Region 6
6. Pronotal collar and scutum with appressed white setae (best seen from in front); length 24–32 mm *flavipennis* Fabricius
- Pronotal collar and scutum without appressed white setae (scutum sometimes with narrow, median stripe of white setae or traces of white setae posterolaterally); length 16–26 mm *funerarius* Gussakovskij

Males

1. Flagellomere III with placoid 2
- Flagellomere III without placoid 4
2. Erect setae of head and thorax dark brown or black; flagellomeres III-VII with placoids; at least tergum II partly red; Iberian Peninsula to Greece, Slovakia, Romania, Hungary, Kazakhstan; Algeria(?) *atropilosus* Kohl
- Erect setae of head and thorax white or pale yellow; placoid distribution and gaster color variable 3
3. Gaster red basally, black distally (western Palearctic; Sichuan, China), or all black (e. Kazakhstan, Siberia; Gansu, China); placoids usually present on flagellomeres III-VIII (Fig. 2), but sometimes on II-VIII, II-IX, III-VI (Fig. 1), III-IX (or IV-VI in Corsica) *funerarius* Gussakovskij
- Gaster all black; placoids present on flagellomeres III-VI (Fig. 3); eastern Mediterranean region to Tajikistan and Afghanistan *oxianus* Gussakovskij
4. Wings nearly uniformly darkly infumate, with no apical dark band; remaining body black; erect setae of head and thorax dark brown or black 5
- Wings nearly hyaline or yellowish to slightly infumate, with darker apical band; gaster at least partly red; legs black or partly red; erect setae of head and thorax dark brown to pale yellow or white 6
5. Iran, Turkmenistan *melas* Gussakovskij
- Northeastern Libya, northwestern Egypt *libycus* de Beaumont
6. Flagellomeres V-VI (Figs. 6–7) or only VI with placoids; gaster color variable *flavipennis* Fabricius
- Flagellomeres IV-VI with placoids (Figs. 4–5) (Corsican *funerarius* will key here, but gaster is red and black); gaster black *leuconotus* Brullé





Figs. 4–9. Scanning electron photographs of male antenna showing placoids on flagellomeres (= F). 4–5, *Sphex leuconotus*, 4 is specimen from Cherkas, Cyprus with placoids on F IV–VI; 5 is specimen from Zaragoza, Spain with placoids on F IV–VI. 6–7, *Sphex flavipennis*, 6 is specimen from Carpentras, France with placoids on F V–VI; 7 is specimen from Zaragoza, Spain with placoids on F V–VI. 8, *Sphex melas* from Repetek, Turkmenistan with placoids on F V–VI. 9, *Sphex libycus* from Marsa Matruh, Egypt with placoids on F V–VI.

DISCUSSION OF SPECIES

Sphex atopilosus Kohl

Sphex maxillosus var. *atopilosus* Kohl 1885:202.

Holotype: female, "Tultscha" [= Tulcea, Romania] (Wien), examined.

Sphex atrohirtus Kohl 1890:437 (lapsus for and redescription of *atopilosus*, raised to species.)

Subsequent records as *atopilosus*: Berland 1952:88 (France); Leclercq 1955:19 (Africa); Leclercq 1956:324 (Greece); Bajári 1957:79 (Hungary); de Beaumont 1962:19 (Spain); de Beaumont 1965:14 (Greece); Pulawski 1978:183 (s. Russia, Caucasus); Mingo and Gayubo 1984:145 (Spain); Józán 1986:367 (Hungary); Gayubo 1987:106 (Spain); Hamon, Fonfria, and Tussac 1991:131 (France); Bitsch et al., 1997:69 (s. France); Shkuratov 1998:97 (Rostov Oblast', Russia).

Subsequent records as *atrohirtus*: Roth 1925:397

(Africa); Chaudoir 1947:142 (France); Zavalil and Šnoflák 1948:168 (Czechoslovakia); de Andrade 1949:8 (Portugal); Berland and Bernard 1949:4 (France); Hamon 1950:29 (France); Benedek 1968:70 (Hungary); Balthasar 1972:421 (Czechoslovakia); Kazenas 1978:40 (Kazakhstan); Dollfuss 1989:12, 15 (type material); Pádr (in Šedivý) 1989:166 (Slovakia).

Recognition.—The dark erect setae of the head and thorax distinguish *atopilosus* from other species in the *flavipennis* group with red and black legs and gaster. The short female petiole (at most minimally longer than wide) is similar to that of *leuconotus*, but the erect setae are pale in that species. The female mid- and hindfemora have erect setae but they are shorter on the dorsum than in *leuconotus*. The broad

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Figs. 1–3. Scanning electron photographs of male antenna showing placoids on flagellomeres (= F). 1–2, *Sphex funerarius*, 1 is specimen from Tanger, Morocco with placoids on F III–VI; 2 is specimen from Italy with placoids on F III–VIII. 3, *Sphex oxianus* from Kondara Canyon, Tadjikistan with placoids on F III–VI.

placoids on male flagellomeres III-VII differentiate *atopilosus* from *leuconotus* which has narrower ones on IV-VI (Figs. 4-5). The size range of female *atopilosus* is 18-27 mm which is somewhat less than the common parameters for females of *leuconotus* (22-33 mm).

Material examined.—Kohl's holotype bears his handwritten label "atrohirtus Kohl Type", and he obviously intended the species name to be *atrohirtus*, but it was published as *atopilosus*. A second female from "Transcauc." also has Kohl's label "atrohirtus Kohl type" (Vienna), but it was not mentioned in the original description and cannot be a type. It was listed by Kohl (1890) who also had material from Sarepta (= Volgograd, Russia).

Other material examined: SPAIN: Villarina, Salamanca, July 21, 1995 (female, Menke), Valdepeñas, June 21, 1983 (male, Menke), Madrid (female, CAS); FRANCE: Canet, June 14, 1948 (female, Menke), St. Nazaire, June 14, 1948 (male, Menke); GREECE: Kalamata (one of a series studied by de Beaumont 1965) (male, CAS); RUSSIA, Kalmyk Republic: 10 km NW of Chernozemel'sk (female, CAS); and ALGERIA: "Oran, 1895", collected by Schmiedeknecht (three females, one male, Vienna) and identified by Kohl as "atrohirtus" (i.e., *atopilosus*). However, these Algerian specimens may have incorrect provenance labels (see Distribution below).

Holotype features.—Kohl's holotype has yellow tinted wings. The legs are largely black but the following are reddish: anterior face of forefemur, and all of foretibia and tarsus; distal fourth of anterior face of midfemur, and anterior face of midtibia. Tergum I is red but there is a large, circular black spot on the anterior face. Tergum II is entirely red, and III is red laterally. Sterna I-III are red (except petiole is black). The specimen is 21 mm long.

Variation.—Petiole length and color of the gaster and legs vary in *atopilosus*. Female petiole length varies from $0.9\times$ to

$1.1\times$ its apical width, but it is usually slightly more than the distal width (example ratios are 18:17, 19.5:17, 21:20). Sometimes the dimensions are equal. In the largest female studied, a specimen 27 mm long labeled Oran, the petiole is slightly shorter than its width (ratio 21:24). In smaller specimens from Oran the petiole is as long as wide. Increasing body size thus may be correlated with a shortening of the petiole. The male petiole is longer than wide (20.5:17.5, Oran; 20:14, Greece).

Gaster color in the female from Chernozemel'sk is similar to the holotype, but the red is limited to tergum I apically and laterally and tergum III basolaterally. Red is reduced in the Spanish females: narrow strip along distal margin of tergum I, tergum II laterally, and most of sternum II. The Spanish male is similar, but additionally has red laterally at the extreme base of tergum III (M. Ohl *in litt.* to Menke says tergum III is all black in Spanish males he has studied). A female and male from France are similar, but the red is more extensive in the female: tergum II all red, and III red basolaterally. In the Greek male red covers the sides of tergum I, all of II, tergum III basolaterally, all of sternum II, and the basal half or so of sternum III.

Legs are bicolored in females, but the amount of black and red varies. The female from Russia is similar to the holotype, but the posterior surface of the foretibia is black. The midleg of one female from Oran is black except for a small, circular amber spot at the femoral apex, and the hind surfaces of the foreleg are dark. In the Spanish females red is limited to the apex of the fore- and midfemora anteriorly, and to the anterior surfaces of the fore- and midtibiae. The legs are all black in the French and Greek males.

Females are 18-27 mm, and males are 17-22 mm long.

Distribution.—Northern Mediterranean region (except Italy) eastward to Kazakh-

tan. The species is uncommonly collected, although locally abundant at times.

Specimens mentioned above labeled Oran, Algeria, may have been mislabeled since the species has not been collected in that country by modern workers (e.g., de Beaumont, Guichard, Roth); nor did collectors of the 1890's find it (Saunders 1910, Morice 1911). The only other record from Algeria is by Roth (1925) who saw a female from Orléansville (now El Asnama) dated 1867 in the Sichel Collection (Paris).

Sphex flavipennis Fabricius
(Figs. 6–7)

Sphex flavipennis Fabricius 1793:201. Lectotype: female, "Italia" (Copenhagen), designated by van der Vecht 1961:31, not examined.

Sphex rufocinctus Brullé 1833:367. Holotype (or syntype): male, "Pétalidi, Morée" [= Korone or Koroni, Peloponnesus, Greece] (Paris), examined. **New synonym.**

Sphex bicolor Dahlbom 1845:437. Holotype: male, "Dalmatia" [= coastal Croatia and Montenegro] (Berlin?), (junior primary homonym of *Sphex bicolor* Fabricius 1775), not examined. Synonymy by Kohl 1881:39 who saw Dahlbom's material (with *maxillosus*), and Kohl 1890:236 (with *flavipennis*).

Sphex cinereorufocinctus Dahlbom 1845:437. Syn-types: male, "Rhodus" [= Rhodes, Greece] (Lund), not examined. Synonymy by de Beaumont 1949:127 who saw Dahlbom's material.

Sphex sellae Gribodo 1873:86. Holotype: female, "Sicilia" [= Sicily, Italy] (Genova?), not examined. Synonymy by Kohl 1890:236.

Sphex flavipennis var. *rufodorsatus* De-Stefani 1887:88, pl. 2, fig. 8. Holotype: female, "Sicilia" [= Sicily, Italy] (Palermo?, Genova?, destroyed?), not examined. Synonymy by Kohl 1890:236.

Recognition.—The presence in most females of appressed white setae on the pronotal collar and scutum identifies *flavipennis* and separates the species from the similar *funerarius* which lacks such pubescence. Unfortunately the appressed setae are poorly developed in some populations, and in older material they are often

worn away. In such cases association with males may offer the only reliable means of identification (note however, that if long, erect setae are present but appressed setae are absent, it is likely that a specimen is not *flavipennis*). Females of *flavipennis* tend to be larger than those of *funerarius* (24–32 mm long versus 16–26 mm). Some females of *Sphex leuconotus* have appressed white setae on the thoracic dorsum but the petiole is shorter than wide or at most as long as wide. Females of *flavipennis* have a petiole that is longer than wide.

The appressed pale setae are less developed in males, but placoids are found only on flagellomeres V–VI (rarely only on VI), and they are narrow (Figs. 6–7). In *funerarius*, placoids are broad (Figs. 1–2) and usually present on flagellomeres III–VIII (but see that species for placoid variation). Males of *leuconotus* have placoids on flagellomeres IV–VI (Figs. 4–5).

Females are 24–32 mm, and males are 17–26 mm long.

Previous workers have used other characters to identify *flavipennis*, but we have found them unreliable: yellow-tinted wings and golden erect setae on the face. The erect facial setae are sometimes silver in *flavipennis*, and nearly always this color in *funerarius*. The yellow tinted wings, from which the species derives its name, is not a reliable recognition character for *flavipennis* because some *funerarius* also have yellowish wings, although typically they are lightly brown stained. Several authors have used comparative lengths of the petiole and hindtarsomere I or III to distinguish females of *flavipennis* from *funerarius*. It is unclear how petiole length was measured by these workers, but we have been unable to find any useful differences. Comparisons of the length and width of the female petiole itself show nearly the same parameters in both species (15 specimens of each species measured): *flavipennis*—petiole length is 1.1 to 1.4× width; *funerarius*—petiole length is 1.1 to 1.6× length.

Hamon, Fonfria, and Tussac (1991) illustrated two male characters that earlier authors had used to separate *flavipennis* and *funerarius*: the form of the clypeal free margin and the length of the lateral setal brushes of sternum VII. These characters are useful, but they are not always reliable. The clypeal free margin in *flavipennis* is usually a simple arc, but sometimes there is a shallow emargination that may be broad or narrow. In *funerarius* the clypeal free margin usually has a pronounced emargination (see Fig. 10 in Hamon et al. 1991). The lateral setal brushes of male sternum VII are shorter in *flavipennis* in comparison to *funerarius* (see figs. 11–12 in Hamon et al. 1991), but the reliability of this character remains to be proven.

Type material.—Brullé's holotype (or sole surviving syntype) of *rufocinctus*, a male, has been studied by each of us on two occasions. The specimen is poorly preserved, very dirty, and badly worn. The mandibles are truncated from considerable use, and the setation of the clypeal disk is worn away. The type has lost most of its antennae; the scapes and pedicels remain, and the right antenna still has flagellomeres I-II. Although the pronotum is dirty, some silver appressed setae (one of the characteristics of *flavipennis*) are faintly visible. Traces of appressed silver setae are also visible in the scutal furrows and on the hindmargin of the scutellum. The clypeal margin is not emarginate although it is straight at the middle. The lateral setal brushes on sternum VII are dirty, but the setae are as short as in *flavipennis* (shorter than in *funerarius*). The body length of 25 mm is also typical of male *flavipennis*. The gaster is mostly black, but tergum II is red except for a narrow, transverse dark band along the distal margin, and tergum III is red laterally. This color pattern is typical of *flavipennis*. These characters convince us that the type of *rufocinctus* is not conspecific with *funerarius* (*maxillosus* of authors), but instead is *flavipennis* Fabricius. The bi-

colored gaster indicates that *rufocinctus* is not conspecific with *leuconotus*.

We have been unsuccessful in locating the type material of *bicolor* Dahlbom, *sellae* Gribodo, and *rufodorsatus* De-Stefani, and have relied on Kohl (1890) for their synonymy.

Variation.—Occasionally the thoracic dorsum of female *flavipennis* has reddish areas, a trait that immediately identifies Mediterranean specimens as this species (similar reddish areas are found on some central Asian specimens of *funerarius*). De Beaumont and Bytinski-Salz (1955) noted that occasional Israeli females have an entirely red thorax, but they occur with normally colored specimens. The thorax of some females in Iran is also extensively red (de Beaumont 1957). De Beaumont (1960) noted a male from Cyprus with a placoid only on flagellomere VI.

In a male of *flavipennis* from the Mashad area, Iran (CAS), the lateral setal brushes of SVII are longer than a midocellus diameter. Four other males from Mashad have typically short brushes.

Distribution.—Mediterranean region including islands of Mallorca, Sardinia, Sicily, Crete, Rhodes and Cyprus; eastward to Hungary, Bulgaria, and south-central Asia (Kazakhstan, Uzbekistan, Tajikistan, Turkmenistan); Arabia: United Arab Emirates; Iran, Afghanistan.

Sphex funerarius Gussakovskij

(= *Sphex maxillosus* of authors before 1976, or *rufocinctus* of authors after 1975) (Figs. 1–2)

Sphex maxillosus Fabricius 1793:208. Lectotype: female, "Barbaria" [= northwest Africa] (Copenhagen), designated by van der Vecht 1961:30, (junior primary homonym of *Sphex maxillosus* Poiret 1787).

Sphex obscurus Fischer de Waldheim 1843:122. Syntypes: male, "in Rossia australi" (Moscow, St. Petersburg, Dresden?), (junior primary homonym of *Sphex obscurus* Schrank 1802, and *Sphex obscurus* Fabricius 1804). Synonymy with *maxillosus* by Kohl 1895:69. **New synonym.**

Sphex maxillosus var. *pedibus nigris* Zanon 1925: 90. Holotype: female, Fueihat, Libya (Genova?). Polynomial, not available, see Art. 11.4 of the Code.

Sphex funerarius Gussakovskij 1934:3. Lectotype: male, [Bei-lung-shui,] S. Kansu [= Gansu], China (Stockholm), **here designated** in order to ensure the name's proper and consistent application, examined. **New synonym.**

Sphex maxillosus ssp. *mavromoustakis* de Beaumont 1947:383. Holotype: female, Polemidia Hills, Cyprus (Lausanne), examined. **New synonym.**

Sphex rufocinctus (misinterpretations since 1975): Lomholdt 1975:68 (Gotland I., Sweden); Bohart and Menke 1976:116 (listed, nomenclature problems); Guichard 1978:270 (Greece); Richards 1979:400 (British Channel Is.); Pagliano 1980:110 (Italy); Dollfuss 1983:2 (Austria); Mingo and Gayubo 1984:146 (Spain); Schmidt and Westrich 1983:120 (Greece); Gayubo 1984:356 (Portugal); Gayubo and Tormos 1984:8 (Spain); Pagliano 1984:367 (Italy); Chevin and Chevin 1985:38 (France); Eiroa and Novoa 1985:23 (Spain); Józán 1985:55 (Hungary), 76 (floral records), 83 (ecological and zoogeographic characteristics); Pagliano 1985:12 (Italy); Tormos and Jiménez 1985:32 (Spain); Westrich and Schmidt 1985b:112 (Germany: endangered in Baden-Württemberg); Gayubo 1986a:35 (Spain), 1986b:30 (Spain); Gayubo and Heras 1986:26 (Spain); Gayubo and Sanza 1986:27 (Spain); Gayubo and Tormos 1986a:8 (Spain), 1986b:4 (Spain); Islamov 1986:515 (Uzbekistan); Asís and Jiménez 1987:23 (Spain); Gayubo 1987:106 (Spain); Tormos and Jiménez 1987a:122 (Spain), 1987b:316 (Spain); Andersson et al. 1987:72 (endangered in Sweden); Dollfuss 1987:18 (latest Austrian specimens collected in 1952 and 1953); Schmidt and Westrich 1987:358 (Germany); Chevin 1988:14 (France); Dollfuss 1988:20 (Austria); Janzon 1988:1 (Sweden); Karsai 1988:99 (Hungary); Islamov 1989:49 (Uzbekistan: nest and prey); Jacobs 1989:3 (Germany); Józán 1989:100 (Hungary); Asís, Gayubo, and Tormos 1990:240 (mature larva); Gayubo, Asís, and Tormos 1990:9 (Spain); Jacobs and Oehlke 1990:122, 132 (German Democratic Republic: not collected after 1960); Pagliano 1990:60 (in catalogue of Italian Sphecidae); Day 1991:xix (summary of European Endangered Hyme-

noptera Lists); Dollfuss 1991:27 (in revision of Austrian Sphecidae); Gayubo, Borsato, and Osella 1991:392 (Italy); Gayubo and Torres 1991:Table I and p. 81 (Spain: effects of urban pressure); Hamon, Fonfria, and Tussac 1991:128, 131 (in key to French Sphecini), 132 (France); Józán 1991:602 (Hungary); Kazenas and Nasyrova 1991:38 (Kazakhstan); Negrisolo 1991:316 (Italy); Schembri 1991:177 (previous records from Malta); Gayubo, Borsato, and Osella 1992:275 (Greece, Turkey); Józán 1992:171 (Hungary); Kazenas and Tobias 1992:29 (sleeping aggregations); Gayubo, Tormos, and Asís 1993:308 (teratological specimen); Torregrosa, Gayubo, Tormos, and Asís 1993:11 (Spain); Luchetti 1993:10 (Italy: Sardegna); Dollfuss 1994:98 (endangered in Austria); Gayubo and Borsato 1994:199 (Italy); Tormos, Asís, and Gayubo 1994:187 (Spain); Józán 1995:104 (Hungary); Krasnobayev et al. 1995:139 (Russia: Samara Oblast'); Negrisolo 1995:18, 22 (floral records); Pagliano and Pesarini 1995:83 (Italy); Pagliano and Scaramozzino 1995:731 (Italy); Schmid-Egger, Risch and Niehuis 1995:208 (Germany); Vernier 1995:176 (in key); Gusenleitner 1996a:809 (Austria), 1996b:818 (Croatia); Minoranskiy and Shkuratov 1996:81 (Russia: Rostov Oblast'); Schmid-Egger 1996:19 (Germany); Schmid-Egger, Schmidt, and Doczkal 1996:374, 378 (Germany: endangered); Voblenko, Gorobchishin and Nesterov 1996:14 (Ukraine); Bitsch et al. 1997:71 (in sphecid fauna of western Europe); Schmidt and Schmid-Egger 1997:27 (in checklist of German Sphecidae); Dollfuss, Gusenleitner, and Bregant 1998:509 (Austria); González, Gayubo, and Torres 1998:72, 73 (Spain); Zehnder and Zettel 1999:13 (Switzerland); González, Gayubo, and Torres 1999:334.

Recognition.—*Sphex funerarius* varies over its extensive range, both in female and male color and number of male antennal placoids. Some females especially can be difficult to separate from *oxianus* and *flavipennis*. Males are easiest to identify because most specimens have broad placoids on flagellomeres III-VIII (Fig. 2) (males from Corsica are among the more notable exceptions—see Variation below). Only two other species have a placoid on

III: *atropilosus* and *oxianus*. However, the erect setae on the head and thorax are white or pale yellow in male *funerarius*, while they are dark brown or black in *atropilosus*. Most commonly males of *funerarius* have a bicolored gaster in contrast to the all black gaster of *oxianus*. Males of *funerarius* from China can have a black gaster, but the presence of placoids on flagellomeres III-VIII will separate them from *oxianus* which has placoids only on III-VI (Fig. 3) and is unknown from China.

The following are variable in the species, but may aid in identification. The male clypeal free margin usually has a pronounced broad emargination in *funerarius*, and is arcuate or shallowly emarginate in *flavipennis*. However, exceptions in both species weaken the usefulness of this difference. The lateral setal brushness on male sternum VII are longer than a midocellus diameter in *funerarius*, while in other species these are usually shorter than, or about equal to a midocellus diameter. However, there are also exceptions to this character (see Variation under *flavipennis*).

The absence of appressed pale setae on the pronotal collar and scutum separates females of *funerarius* from *flavipennis*. Females of *flavipennis* typically have appressed silver setae on the thorax, but this pubescence is often sparse or worn away. Thus, association with males is often the best way to identify females of both species. As noted under *flavipennis*, female petiole length is essentially identical between the two species. Females of *funerarius* usually have bicolored fore- and midlegs, and the hindleg, except for the tarsus, is usually black. However, red is limited to the foretibial apex in some melanitic Chinese specimens. A similar leg pattern is present in one Iranian female seen by us, but, unlike the black Chinese specimens, the gaster is bicolored. Females of *oxianus* have entirely black legs, including the tarsi.

Females are 16–26 mm, and males are 17–20 mm long.

Nomenclatural history.—This relatively common Palearctic species was known as *Sphex maxillosus* Fabricius 1793, for more than 170 years. Then van der Vecht (1959: 214) pointed out that Fabricius' name was a junior homonym of *Sphex maxillosus* Poiret 1787, currently assigned to the genus *Chlorion*. He noted that unless Poiret's name was suppressed, *maxillosus* Fabricius would have to be replaced by the next available synonym. Van der Vecht believed that to be *leuconotus* Brullé based upon Dalla Torre's (1897) catalog, but that is not true. Bohart and Menke (1976:116) called the species *rufocinctus* Brullé 1833, adopting the first of several synonyms of *maxillosus* recognized by Kohl (1890:433), even though Menke pointed out (footnote 23) that the type of *rufocinctus* appeared to be a synonym of a different species, *flavipennis* Fabricius. Menke urged European workers to study the problem and clarify the identity of Brullé's species. That action has not been forthcoming, and, unfortunately, nearly all contemporary authors since 1976 have used *rufocinctus* as the proper name for the invalid *maxillosus* Fabricius. Our studies of the Brullé types establishes that none of his names, *rufocinctus*, *leuconotus*, or *triangulum*, are available for *maxillosus* Fabricius. Instead, the oldest available name is *funerarius* Gussakovskij 1934.

Type material.—Gussakovskij (1934) listed 15 males and 3 females of *funerarius* from Bei-lung-shi, S. Kansu, China, 15-VI-30, and 2 males from N. O. Szechuan, China, 20-V-30, all collected by Dr. Hummel, and also 3 males and a female from southern Altai (Karasengir) [= Siberia], and one male from Saissan [= Lake Zaisan, Kazakhstan]. We have examined three male and six female syntypes (Stockholm). All but one male are labeled Kina [= China], S. Kansu, Sven Hedins Exp. Ctr. Asien, Dr. Hummel, and one male and one female from Kansu have Gussakovskij's species labels with the word "typus". One male is labeled Kina, N. O. Szechuan, etc., and

it also has a Gussakovskij label. We have selected and labeled as lectotype the male from S. Kansu with Gussakovskij's "typus" label. We have also put paralectotype labels on the male and female that have Gussakovskij labels. The three males have placoids on flagellomeres III-VIII and are entirely black. The females are black except the apical half of the foretibia which is brownish red. In one female the whole outer side of the foretibia is reddish. In two females the inner apex of the forefemur is also reddish.

Variation in placoid distribution.—In a series of papers de Beaumont (1960:229; 1961a:272; 1961b:45; 1967:276; 1970b:4) studied variation in the number of placoids in western Palearctic males. He recorded their distribution as follows: on flagellomeres III-VIII (most European specimens, Fig. 2), but occasionally II-VIII or III-VII; II-VIII or II-IX (Turkey); II-VIII (Crete, Iran); II-IX (Afghanistan); II-VIII or II-IX (Cyprus); and III-VI (Fig. 1), III-VII, or III-VIII (north Africa). Males from the island of Corsica are exceptional in lacking placoids on flagellomeres II and III (de Beaumont 1960:229, also one male in CAS). On this island placoids are only found on flagellomeres IV-VI, and we suspect this to be the typical condition on that island.

Color variation and subspecies.—Female legs are bicolored throughout the range of *funerarius*, although the hindleg is often largely black. The following are commonly red: tibiae and tarsi of the fore- and midlegs and the hindtarsi (the midtibia varies from all red to partially or wholly black). Sometimes the fore- and mid-femora have red areas distally. However, the legs are almost wholly black in females from Gansu, China (type series of *funerarius*) except for some reddish brown on the forefemoral apex and inner side of the foretibia. In one specimen of this series red occurs only on the inner apical half of the foretibia. Specimens that we have seen from other parts of China display the typ-

ical color pattern of the species. Intermediate leg color patterns are seen in four females from Iran (CAS): the foretibia is black and red, and the midleg is all black except for an inner distal red spot on the femur, and the tarsi are sometimes brownish (Elburz Mts.); or the foretibia is black and red and the midtibia is reddish on its anterior surface only, and the midtarsus is brownish (Khorasan). Another Iranian female from Tilabad (USNM) has entirely black legs except for red on the anterior surface of the foretibia.

In females of most populations of *funerarius*, the gaster is red with a black apex (segments IV-VI or V-VI typically). However, the gaster may be all black in females from eastern Kazakhstan, southern Siberia, and the provinces of Sichuan and Gansu in China (sternum II pale laterally in some specimens from Gansu). The gaster is also all black in males from Siberia and Gansu, China. In females from Cyprus, the gaster (except the black petiole), femora and tibiae are red. This insular population was described as *maxillosus mavromoustakisi* by de Beaumont (1947). We have examined the type series of *mavromoustakisi* (2 females, 3 males, from Cyprus), and do not feel that recognizing the subspecies is warranted. The Corsican population, for example, is as distinct based upon male antennal placoid distribution, and yet we also feel it needs no name.

The thorax is typically all black in *funerarius*, but it is partly red in a female from the Kopet-Dagh Mountains south of Ashkhabad, Turkmenistan (CAS). The following are red in this specimen: pronotum apicomeresally and laterally, most of scutum, scutellum, postscutellum and part of propodeal dorsum. Additionally only the last gastral segment (VI) is black in this specimen, and the inner side of the hindtibia is reddish.

Larva.—The mature larva of *funerarius* was described by Asís, Gayubo, and Torres (1990).

Conservation.—*Sphex funerarius* was list-

ed as endangered in Austria, Germany, and Sweden (summary in Day 1991, also Andersson et al. 1987, and Janzon 1988). Dollfuss (1987) reported that the last Austrian specimens were collected in 1952 and 1953, and Jacobs and Oehlke (1990) noted that no specimens were collected in the former German Democratic Republic after 1960. One female, however, was found in Austria in 1996 (Gusenleitner 1996a). Schmid-Egger, Risch, and Niehuis (1995) reported that the species was relatively common in the upper Rhine area of Germany in the 1950's and early 1960's, but disappeared subsequently. However, sightings of *funerarius* increased in the states of Hessen, Baden-Württemberg, and Rheinland-Palatinate. M. Ohl *in litt.* to Menke says the species has also been found recently in Bavaria. Janzon (1988) noted that on the Swedish island of Gotland *funerarius* occurs in open sandy areas, often along the shore. Habitat overgrowth is the main danger to populations of *funerarius* on this Baltic island.

Distribution.—Mediterranean Basin including North Africa from Morocco to Egypt. The Balearic Islands (Compte Sart 1959), as well as the islands of Corsica, Sardinia, Sicily, Malta, Crete, and Cyprus. Recorded from Jersey in the Channel Is. (Richards 1979), but the species does not occur on the British Isles proper. Most of Europe north to Gotland I. and Fårö I. in the Baltic Sea but not in Sweden proper (Andersson et al. 1987) and Poland; eastward to Hungary, Romania, Bulgaria, s. Russia, Siberia (Krasnoyarsk), and south-central Asia: Iran, Afghanistan, Uzbekistan, Kazakhstan, Turkmenistan, Tajikistan; n. China (Gansu, Sichuan, Nei Mongol, Shandong, Liaoning).

***Sphex leuconotus* Brullé, new status**

(*Sphex afer* of authors)

(Figs. 4–5)

Sphex leuconotus Brullé 1833:366. Holotype: female, "Pétalidi, Morée" [= Korone or Koroni, Peloponnesus], Greece. (originally Par-

is, now lost). Neotype: holotype of *Sphex triangulum* Brullé, **present designation** in order to ensure the name's proper and consistent use (Paris), examined.

Sphex triangulum Brullé 1833:365, pl. 50, fig. 6. Holotype: female, "Pétalidi, Morée" [= Korone or Koroni, Peloponnesus], "à la fin de Mai", Greece (Paris), (junior primary homonym of *Sphex triangulum* Villers 1789), examined. **New synonym.**

Sphex afer Lepeletier 1845:350. Lectotype: female, Oran, Algeria, designated by Menke in Bohart and Menke 1976:114 (Paris). **New synonym.**

Sphex sordidus Dahlbom 1845:436. Syntypes: sex unknown, "Rhodus" [= Rhodes, Greece] (Stockholm?). Regarded as subspecies of *afer* by de Beaumont 1953:195. **New synonym.**

Sphex tristis Kohl 1885:200. Syntypes: male, Spain (Wien). Synonymy with *afer* ssp. *sordidus* by de Beaumont 1953:105. **New synonym.**

Sphex plumipes Radoszkowski 1886:25, figs. 18a-i. Holotype: male, Askhabad [Turkmenistan] (Kraków), (junior primary homonym of *Sphex plumipes* Drury 1773), examined. **New synonym.**

Sphex pachysoma Kohl 1890:436. Syntypes: female, "Kilasi" and "Kuba Breku" [= Kilyazi and Kuba, Azerbaijan?]; Cyprus; "Syra" [= Syros I., Greece] (Wien). Synonymy with *tristis* by Dusmet and Mercet 1906:516, with *afer* by Schulz 1911:68 and with *afer* ssp. *sordidus* by de Beaumont 1953:195. **New synonym.**

Recognition.—The female and most males of *leuconotus* can be recognized by an unusually short petiole whose distal width is usually greater than the length. In occasional specimens the measurements are equal. In 12 females measured, the petiole width varied from 1.0× to 1.5× its length, with the average being 1.2×. Some females have appressed white setae on top of the pronotal collar. Traces of appressed white setae can also sometimes be seen on the scutum. In the male, narrow placoids are present on flagellomeres IV–VI (Figs. 4–5).

Females are 25–34 mm, and males are 17–23 mm long.

Type material and synonymy.—Kohl

(1890:433) synonymized *triangulum* Brullé with *Sphex maxillosus* Fabricius, and Bohart and Menke (1976) listed it as a synonym of *rufocinctus* Brullé. The holotype (or the only surviving syntype) is actually identical with *Sphex afer sordidus* Dahlbom. The specimen has the typical short petiole of *afer* (ratio 24:19). The mid and hindfemora have long, erect setae on the upper, outer, and lower surfaces. Tergum I of the type is mostly black (apex red), and terga IV-VI are also black. Terga II-III are red. The legs are black and the wings are yellowish. The name *triangulum* Brullé is a junior homonym.

The next available name for this species is *leuconotus* Brullé which was collected at the same locality as *triangulum*. We were unable to find a type of *leuconotus* in Paris, and apparently it has been destroyed. Brullé stated that *leuconotus* and *triangulum* were very similar, differing primarily in the form of the mandible and the setation of the clypeus. His description of the mandible of *triangulum* suggests that he had a female with mandibular wear common to old specimens, the result of much nest excavation, and this is confirmed by examination of the holotype. The mandibles are badly worn. Concurrent with such wear is the loss of clypeal setation, and Brullé described the clypeus of *triangulum* as being largely devoid of setae. Brullé's specimen of *leuconotus*, on the other hand, must have been a fresh one, judging from his description. The mandible was long, and the clypeus was mostly covered with setae. In his description of *leuconotus*, Brullé referred to plate 14, fig. 1, in Savigny's (1809-1829) *Description de l'Égypte*. The figures on the plates from this work are remarkable for their time, but they were based on material from Egypt, and *Sphex afer* is not known from that country. The wasp shown in figure 1 has a short petiole although it is longer than wide. The accompanying figure of the mandible shows an unworn one with a long, acuminate apex. Perhaps Brullé simply wanted to in-

dicate that his *leuconotus* was similar to Savigny's figure. In any case, his description of *leuconotus* agrees with *afer sordidus*.

Since the differences between *leuconotus* and *triangulum* appear to represent age differences of the specimens, and Brullé's own feeling was that he would otherwise regard them as identical, we are certain that *leuconotus* is conspecific with *triangulum*. Accordingly we have made the type of *triangulum* the neotype of *leuconotus* and have so labeled it.

A result of the foregoing is that *Sphex afer sordidus* must now be called *leuconotus* Brullé. According to de Beaumont (1953:195), *tristis* Kohl and *pachysoma* Kohl are synonyms of *sordidus*. Thus they are new synonyms of *leuconotus* Brullé s.s.

We have also studied the male type of *plumipes* Radoszkowski. It is labeled "plumosus" in Radoszkowski's handwriting, and agrees with his description, but the type lacks its antennae and the gastral apex, presumably lost when he extracted the genitalia (which are glued to a piece of card mounted on the pin with the specimen). *Sphex plumipes* was tentatively synonymized with *pachysoma* (i.e., *leuconotus*) by Kohl (1890:436), whose interpretation is most likely correct. The type is all black with some appressed white setae on the collar, almost silvery scutal setae, and slightly yellowish wings with a darker apical band. This color combination is found only in *leuconotus* and *oxianus*, but the holotype's relatively short gastral petiole (length equal to 1.25× apical width) suggests *leuconotus*. In any case, Radoszkowski's name is a junior homonym.

Color variation and subspecies.—Gaster color varies in females. Sometimes it is entirely red (Cyprus, Uzbekistan), or tergum I may be black basally and IV-VI entirely so (Cyprus, Spain, n.w. Africa). In Romania the gaster may be all black (Scobiola 1960), and de Beaumont (1960:227) studied a single female with a black gaster from eastern Libya and four females with bicolored gasters from western Libya.

Males of *leuconotus* from northwest Africa have darker erect body setae than specimens from the northern Mediterranean and eastward, and the wings are smoky. The wings are clear in the eastern Libyan female mentioned above, and those from western Libya are less smoky than females from northwest Africa. Those who would like to treat the northwest African population as a subspecies (an action we do not endorse) will have to call it *leuconotus* ssp. *afer*.

Distribution.—Mediterranean region (except Egypt and known only from the Pyrénées-Orientales Département in France) including islands of Sardinia, Rhodes, and Cyprus; eastward to Bulgaria, Greece, Turkey, Israel, Iraq, Iran, Afghanistan and the central Asian republics of Kazakhstan, Turkmenistan and Uzbekistan.

***Sphex libycus* de Beaumont**
(Fig. 9)

Sphex libycus de Beaumont 1956:182. Holotype: female, Porto Bardia, Libya (Zürich), not examined. Subsequent record: de Beaumont 1960:227 (Libya, Egypt).

Recognition and status.—This species is wholly black except for appressed silver facial setae in both sexes. The wings are darkly infumate. The female hindfemur has erect setae, and the male has placoids on flagellomeres V-VI (Fig. 9). *Sphex libycus* is almost identical to *melas* Gussakovskij, another all black species, and certainly the males cannot presently be separated. The only difference in the females is the color of the appressed facial setae: silvery in *libycus* and brown in *melas*. Erect hindfemoral setae are present on the posteroventral edge in *libycus*, but in *melas* they may be present (Iranian female) or absent (Turkmen female). Much more material of both species is needed to determine if *libycus* is a valid species or merely a geographic color form of *melas*.

Females are 24–28 mm, and males are 20–22 mm long.

Taxonomic history.—*Sphex libycus* was first described in detail by Roth (in Schulthess 1926:210) who studied one female from Agedabia in Cyrenaica, Libya, calling it "*Sphex maxillosus* var. *tota nigra, alis valde infumatis*." He noted the all black body (except for partly dark red mandibles), the dark body setation, and intensely infumate wings. De Beaumont (1956) recognized that Roth's wasp was a different species and gave it the name *libycus*.

Material examined.—We have seen three females and four males collected 64 km W of Marsa Matruh, EGYPT, by Pulawski on 28–29 May 1993 (CAS, USNM).

Distribution.—Known only from the northeast coast of Africa: northeastern Libya and northwestern Egypt.

***Sphex melas* Gussakovskij**
(Fig. 8)

Sphex melas Gussakovskij 1930:207. Syntypes: male, female, Repetek, Turkmenistan (St. Petersburg), not examined.

Recognition.—*Sphex melas* is nearly unique in the *flavipennis* group in being all black, including the wings, legs, and all erect setae. Appressed silver setae are found only on the face of the male. *Sphex libycus* is the only similar species, but the brown appressed facial setae of female *melas* separate it from *libycus* which has silver facial setae. Males of the two species cannot presently be separated morphologically. Other characters of *melas* include: no silvery setae on pronotum, male with broad placoids on flagellomeres V-VI (Fig. 8, placoids narrower in *flavipennis* Figs. 6–7), and lateral setal brushes of sternum VII markedly shorter than in *funerarius*.

Females are 22–28 mm, and males are 15.5–17 mm long.

Some male specimens of *Sphex funerarius* from the eastern part of its range (e. Kazakhstan, s. Siberia, China) are all black, as are males of *oxianus* and some males of *leuconotus*. However, the erect body setae are pale in these species, and the wings are only slightly infumate.

Material examined.—We have examined topotypic material of *melas* (2 females, 4 males) determined by Gussakovskij (Moscow, CAS, USNM), and also a female from Hamadan, IRAN (CAS) and a female from Imam Baba, TURKMENISTAN (USNM).

Distribution.—Turkmenistan and Iran.

Sphex oxianus Gussakovskij

(Fig. 3)

Sphex oxianus Gussakovskij 1928:3. Syntypes: male, "Kara-tau mountains, right shore of Amu-Darya, below Khiva" [Uzbekistan] (St. Petersburg), not examined. Subsequent records: Gussakovskij 1930:208 (description of female; Turkmenistan, Uzbekistan); Gussakovskij 1933:273 (Iran); Gussakovskij 1935:413 (Tadjikistan); de Beaumont 1960:170 (Afghanistan); de Beaumont 1967:276 (Turkey); de Beaumont 1968:156 (redescription); de Beaumont 1969:81 (Turkey); de Beaumont 1970a:393 (Afghanistan); de Beaumont 1970b:4 (Iran).

Sphex oxianus form *nubilus* de Beaumont 1968:156. Holotype: female, Ein Gedi, Israel (W. Schläffle Collection, Kaiseraugst, Switzerland), not examined. Bohart and Menke (1976:116) listed *nubilus* as a subspecies of *oxianus* thus validating de Beaumont's name—Article 45.6.4.1 of the Code, 4th edition (ICZN, 1999). **New synonym.**

Recognition.—The entirely black legs, including the tarsi, separates *oxianus* from other species in the *flavipennis* group except *melas* and *libycus* which are similarly colored. However, *oxianus* has pale erect setae on the head and thorax, unlike the dark setation of *melas* and *libycus*. The female petiole is longer (length 1.6–2.0 × width) than in the other species of the group. For example: 0.6–1.0 × apical width in *leuconotus*, 0.9–1.1 × apical width in *atropilosus*, 1.1–1.4 × apical width in *flavipennis*, and 1.1–1.6 × apical width in *funerarius*. In the male, broad placoids are present on flagellomeres III–VI (Fig. 3), the gaster is all black, and the lateral setal brushes of sternum VII are inconspicuous (shorter than in *funerarius*).

Females of *oxianus* from the eastern

Mediterranean with an all black gaster can be distinguished from the similarly colored *melas* by the pale erect body setae. Most females of *oxianus* have virtually no erect setae on the mid- and hindfemora, or setation is very sparse. In contrast, females of *flavipennis* and *funerarius* usually have some erect setae on the mid- and hindfemora, especially on the lower surface. The femora of female *leuconotus* have considerable erect setae.

Diagnostic characters given by Gussakovskij (1928, 1930) are of little value because he compared the species to *Sphex pruinosus* Germar rather than to a species in the *flavipennis* group. De Beaumont (1968) thought that *oxianus* differed from *flavipennis* and *funerarius* (as *maxillosus*) in being slenderer, in having a slightly longer female petiole, finer body sculpture, and a female clypeus that is smooth and shiny along the median line and next to the clypeal lip. However, only the female petiole length is useful.

Females are 19–29 mm and males are 14.5–22 mm long.

Material examined.—We have seen a male and female identified by Gussakovskij as *oxianus* from TADJIKISTAN: Changhir and Kabadian (Menke, USNM), and one female identified by Gussakovskij from TURKMENISTAN: Krasnovodsk (Menke). The following have also been studied, all in the CAS: TURKEY: Urfa (male, female); TURKMENISTAN: Baharden (3 females); TADJIKISTAN: Ramit, Dushanbe, Khodzha, and Kondara Canyon (3 males, 4 females).

Variation.—Both Gussakovskij and de Beaumont thought the female was characterized by an entirely red gaster (excluding the petiole), although de Beaumont saw an all black specimen from Israel (his *nubilus*). De Beaumont (1969:81) noted a female from Turkey in which gastral segments V–VI were black, the remainder red. We have seen similar females from Urfa, Turkey, and Baharden, Turkmenistan (all CAS). The gaster and petiole are all red in

a female from Dushanbe, Tajikistan (CAS). From this we conclude that the female gaster varies from all red to all black in *oxianus*.

Distribution.—Israel, Turkey, Iran, Afghanistan, Uzbekistan, Turkmenistan, and Tajikistan.

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